

14 April 2008

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**Memorandum**

**TO:** *David Paylor, Director, Department of Environmental Quality*  
**FROM:** *Vivian Thomson, Vice Chair, Air Pollution Control Board*  
**RE:** *Questions for DEQ Staff on Proposed Permits for Virginia Electric and Power Company's Virginia City Hybrid Energy Center*

At our last Board meeting on 20 March 2008, you requested questions from the Board members concerning Dominion's proposed Virginia City Hybrid Energy Center. Last week I sent you a draft of these questions. Please use this updated version for your response.

I have crafted my questions and requests based on DEQ documents and publicly available comments provided by Dominion, the Federal Land Managers, and members of the public. Additional documents or sources of information are cited.

I ask for written answers to the questions or requests in each numbered item. Please don't hesitate to indicate if these inquiries would require burdensome analysis, or if there are insufficient data to respond, or if you think there is a better way to address these issues.

Thank you for returning my phone call of last week. I look forward to talking about these issues. Naturally, I stand ready to clarify my questions, if need be.

***I. MACT and BACT analysis***

We do not yet have public comments on the MACT permit proposal since that comment period has not closed. Other Board members and I will undoubtedly have more questions about MACT after those comments are received. However, I have some comments based on the information I have seen to date.

The BACT and MACT determinations cannot be made separately. So the BACT determination for this facility cannot be finalized until DEQ has received the MACT comments and has incorporated those comments into a combined BACT/MACT determination.

In 2005 STAPPA/ALAPCO (now known as National Association of Clean Air Agencies) proposed a two-phased model rule for mercury emissions from power plants. The second phase of that model rule would take effect in 2012 and it specifies for new facilities an output based limit of 0.0025 to 0.0060 lb/GWh (12-month rolling average) (National Association of Clean Air Agencies 2005).

At our last meeting Board Member Hullie Moore read his conclusion that “eight Virginia coal facilities that have, or by 2010, will have mercury emission rates far below the limit proposed for Wise County. The total estimated mercury emissions for all eight plants in 2010 are 49.87 pounds. That’s almost identical to the limit proposed for just this one new plant, 49.46 pounds. And, the total capacity of the eight plants is 2,252 MW compared to Wise County’s 664 MW” (Moore 2008).

Further, the National Parks and Conservation Association has submitted a consultant analysis (the Hensley Report) showing that the best-in-class IGCC facilities or best-in-class pulverized coal facilities emit much less mercury than the proposed Dominion facility. Under the Clean Air Act, MACT is the “emission level achieved in practice by the best controlled similar source” (Hensley Energy Consulting 2008).

(1) Given all of the above information, how can the proposed permit’s mercury emission rate of 0.014 lb/GHw (12-month rolling average) be deemed MACT (Virginia Department of Environmental Quality 2008)?

(2) More generally, what annual emission levels of criteria pollutants, hazardous air pollutants, carbon dioxide, and N<sub>2</sub>O would be achieved at the Virginia City Hybrid Energy Center if the BACT and MACT analyses included the best-in-class emission rates from IGCC or pulverized coal facilities? In doing this analysis, please conduct literature searches and obtain information directly from vendors to analyze the most advanced technologies, e.g., IGCC, different coals, coal cleaning, wet flue gas desulfurization, selective catalytic reduction. What are the emission rates for criteria pollutants, hazardous air pollutants, carbon dioxide, and N<sub>2</sub>O of the permitted IGCC facilities referred to in the National Energy Technology Laboratory’s recent report on coal-fired generation plants in the US (National Energy Technology Laboratory 2008)? How does DEQ reconcile the contradictory claims of Dominion, on the one hand, and the Hensley Report, on the other hand, concerning potential emission rates of conventional and hazardous pollutants from IGCC facilities relative to the Virginia Hybrid Energy Facility’s CFB proposal (Hensley Energy Consulting 2008, Dominion Resources Services 2008)? The Virginia Hybrid Energy Facility will emit several hazardous air pollutants associated with cancer and with other serious health effects. What health risks will be caused by the Virginia Hybrid Energy Facility’s emissions of hazardous (or “toxic”) air pollutants?

(3) What is the status of the draft mercury air deposition modeling report that was due to DEQ on 31 January 2008, as indicated in the timeline for the Virginia Mercury Study? Please send this draft document to all members of the Air Board, as well as all documents that have resulted from DEQ’s study of mercury emissions, deposition, and contamination in the Commonwealth. Please make all of the documents and presentations from the mercury study and symposium easily available to all members of the public, and create a link to those

documents from the new link to be established on DEQ's homepage for the Virginia City Hybrid Energy facility. As of today, several documents on the DEQ's Mercury Conference website cannot be downloaded because of error messages.

The Virginia Health Department prohibits the consumption of fish from the North Fork of the Holston River because of mercury and PCB contamination (Virginia Department of Health 2008). It appears that this section of the River is not far from the planned Virginia Hybrid Energy Facility.

(4) How much mercury will be deposited in the North Fork of the Holston River as a result of Virginia City Hybrid Energy Facility's emissions? How much additional mercury will be deposited in other Virginia waterways as a result of this facility's emissions?

## ***II. Air quality concerns***

**(A) Ozone and PM impacts** Under the Clean Air Act and Virginia's PSD regulations, this facility may not contribute to non-attainment of pollutants in any air quality control region. EPA's maps show that, based on 2004-06 data, areas in Tennessee and North Carolina close to Wise County have monitored ozone levels that would put them in nonattainment for the new primary and secondary ozone standards

([http://www.epa.gov/air/ozonepollution/pdfs/2008\\_03\\_monitors\\_violating\\_2008.pdf](http://www.epa.gov/air/ozonepollution/pdfs/2008_03_monitors_violating_2008.pdf)).

(5) What ozone levels have been reached recently in the six Class I areas within 300 km of the facility, especially during the hot summer of 2007?

(6) What is the likely ozone attainment status of these six Class I areas, based on 2005-07 ozone season data and using the new ozone standards? Please provide a map showing the likely ozone attainment/nonattainment status of all counties in Virginia, Tennessee, and North Carolina, based on 2005-07 ozone data and using the new ozone NAAQS. Please provide a map showing the PM<sub>2.5</sub> nonattainment status of all counties in Virginia, eastern Tennessee, and North Carolina.

I have not seen ozone modeling by DEQ or Dominion estimating the impacts of the facility's 1,971 tons/year of NO<sub>x</sub> or 139 tons/year of VOC.

(7) What are the modeled effects of the Virginia City Hybrid Energy facility's emissions on ozone and PM<sub>2.5</sub> levels in the six nearby Class I areas?

**(B) Cumulative increment analysis** According to the National Park Service, Dominion revised the cumulative increment analysis by removing some of the "non-PSD" sources from the increment-consuming inventory (National Park Service 2008). The National Park Service and others have questioned this cumulative increment analysis, which demonstrated that the

proposed facility's emissions would not contribute to an increment violation in Class I areas. Under EPA's guidance for increment consumption analysis, other sources of SO<sub>2</sub> should be included in the cumulative increment analysis.

(8) How much of the SO<sub>2</sub> increment in nearby Class I areas would be consumed if the maximum actual or allowable 24-hour and 3-hour emission rates for the sources identified by the Southern Environmental Law Center--Eastman Chemical, John Sevier power plant, Kingston power plant, Bull Run power plant, Duke Energy's Cliffside power plant, and AEP's Clinch power plant--are included in the cumulative increment inventory?

***(C) Modeled NAAQS violations and adverse impacts on visibility and sulfur deposition***

The Southern Environmental Law Center (SELC) points out that emissions from Dominion's proposed facility and AEP's Clinch River power plant will cause modeled exceedances of the NAAQS for PM<sub>10</sub> (24 hour and annual) and SO<sub>2</sub> (3-hour, 24-hour, and annual) (Southern Environmental Law Center 2008, Virginia Department of Environmental Quality 2008a). While the AEP facility at Clinch River will cut its emissions, those levels limit AEP to emissions just under the NAAQS, leading to the logical conclusion that Dominion's facility could cause the NAAQS to be violated at the modeled receptors. The SELC also indicates that the VEPCO facility will "cause serious visibility impacts at PSD Class I areas that exceed the maximum threshold of 10 percent established by Federal Land Managers" and that "annual sulfur deposition rates from FCHEC will exceed the threshold of 0.010 kg/ha/yr established by FLM at several PSD Class I areas" (Southern Environmental Law Center 2008). The Park Service observes that the facility will cause undesirable impacts on visibility in Great Smoky Mountains National Park (National Park Service 2008).

Dominion has agreed to reduce SO<sub>2</sub> emissions by fifty percent from the originally proposed level. However, the most recent EPA progress report on acid rain shows little improvement in sulfate levels and acid neutralizing capacity in Southern Appalachian streams (US Environmental Protection Agency 2007).

(9) Erring on the side of caution, what levels of SO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub> emissions would ensure that the emissions from VCHEC do not cause violations of any NAAQS, visibility impacts exceeding 10 percent, or sulfur deposition rates exceeding the threshold of 0.010 kg/ha/year in any Class I area?

***(D) Modeling inputs***

The following questions have been raised about Dominion's air quality analysis (Southern Environmental Law Center 2008):

(a) The Federal Land Manager has recommended using a finer grid resolution of about one km for Calpuff modeling in complex terrain as was recently used for the White Pine Energy Station in Nevada.

(b) The meteorological data used in this modeling were not validated against actual met data.

(c) Emissions from auxiliary boilers and other sources like materials handling were not included in the modeling.

(d) Cumulative impacts modeling for PM and SO<sub>2</sub> was not conducted.

(e) The visibility analysis used was based on Method 8. However, this method has not been approved by the National Park Service.

(f) No PM<sub>2.5</sub> PSD increment analysis was conducted.

(10) DEQ staff, in consultation with FLM staff, should re-run the air quality models to address the above concerns.

### ***III. Impacts on "other media"***

Under 9 VAC 5-80-1755 permit applicants "shall provide an analysis of the impairment to visibility, soils, and vegetation that would occur as a result of the source or modification. . . ."

(11) Over the life of this facility, what will be the impacts on streams and mountain habitats in the areas mined for coal to supply the facility? Please express in terms of quantifiable impacts to aquatic and forest ecosystems, as well as negative impacts on people (e.g., blasting impacts on homes and impacts of airborne dust on public health).

The Hensley report (Hensley Energy Consulting 2008) observes that the Virginia City facility will generate 2,600,000 tons of ash per year (data obtained from the PSD permit application), ten times the amount produced by a "typical" IGCC facility.

(12) Does DEQ agree with this observation and if not, what is the factual basis for that disagreement? How much less ash would be produced by using a low-ash coal or by washing the coal prior to use?

As I understand it, this ash will be stored on-site or reclaimed for other uses.

(13) How much ash will be stored on-site and how much will be reclaimed? What are the "other uses"? Eventually the ash stored on-site will have to be disposed of in some manner. Where will it be disposed? What are the chemical characteristics of this ash and how must it be

handled to avoid having toxic components like heavy metals become environmentally available?

#### ***IV. Economic impacts and greenhouse gas emissions***

(14) How many temporary and permanent local jobs does Dominion estimate will be created by this facility? What is the nature of these positions, what skills are required, and why does Dominion believe that these jobs will be filled locally? What reliable stream of annual economic benefits will flow to communities surrounding the facility? What would be the economic benefits be if Dominion washed, cleaned, or treated the coal before burning it?

(15) If memory serves correctly, for the CPV Warren PSD permit the Air Pollution Control Board accepted the company's offer to write into the permit 1.15/1 offsets for its NO<sub>x</sub> emissions. That is, because of concerns over high ozone levels in Shenandoah Park, the company agreed to accept an enforceable NO<sub>x</sub> offset that exceeded the new emissions that would be created at the new power plant. I also recall that Dominion has offered to offset a portion of its new emissions at the Virginia City Hybrid Energy Center. What are the details of Dominion's offset offer?

The Virginia City Hybrid Energy Center's large greenhouse gas emissions (5.37 million tons/year of carbon dioxide, plus emissions of N<sub>2</sub>O) are of concern. For perspective, Attachment A provides an estimate of the amount of land area that must be planted in southern pines to offset the proposed facility's annual carbon dioxide emissions (Schlesinger 2008). This estimate was provided by ecologist Dr. William H. Schlesinger, President of the Cary Institute of Ecosystem Studies and former Dean of Duke University's Nicholas School of the Environment and Earth Sciences. Dr. Schlesinger is an expert on carbon sequestration in plants and he has provided Congressional testimony on that subject.

It appears that Wise County's political leaders believe that Dominion has committed to controlling the greenhouse gas emissions from this facility. The Wise County Board of Supervisors resolution supporting the VCHEC, which was adopted 11 January 2008, says that "Dominion has committed to utilize Carbon Capture Capable (CCC) equipment on the proposed facility to limit and reduce Green House Gases (GHG) thereby either eliminating or reducing the 'carbon footprint' of the state-of-the-art Virginia City Hybrid Energy Center. . . . Be it further resolved that the Virginia City Hybrid Energy Center be used as a World Model of how CCC power plants can be developed in the 21<sup>st</sup> century to make significant impacts upon the reduction of GHG emissions, thereby allowing this technology to be exported elsewhere and retrofitted upon existing coal-fired power plants already in operation" (Wise County Board of Supervisors 2008).

(16) To DEQ staff's knowledge, has Dominion committed to eliminate or reduce its greenhouse gases at this facility? How can the proposed facility be viewed as a "World Model" for control of greenhouse gas emissions, as anticipated in the Wise Supervisors' resolution?

(17) The National Energy Technology Laboratory indicates that the \$/tonne of CO<sub>2</sub> avoided for pulverized coal technologies operating with carbon capture is approximately \$50/tonne, or two times that for IGCC plants operating with carbon capture (\$24/tonne CO<sub>2</sub> avoided) (National Energy Technology Laboratory 2007). What is the estimated \$/tonne of CO<sub>2</sub> avoided for circulating fluidized bed technology with carbon capture?

### ***References***

Dominion Resources Services Inc. 2008. Alternative Generating Technology Assessment for the Virginia Hybrid Energy Center. January 18, 2008. Available from the Virginia Department of Environmental Quality.

Hensley Energy Consulting. 2008. Report Comparing Alternative Technologies for The Virginia City Hybrid Energy Center. Prepared for the National Parks Conservation Association (NPCA) and submitted with NPCA's public comments on Draft PSD Permit for Virginia Electric and Power Company's Virginia City Hybrid Energy Center. 12 March 2008.

Hullihen Williams Moore. 2008. Statement and motion. Virginia Air Pollution Control Board meeting, 20 March 2008. Available from the Virginia Department of Environmental Quality.

National Association of Clean Air Agencies. 2005. Regulating Mercury from Power Plants: A Model Rule for States and Localities. Available at <http://www.4cleanair.org/FinalMercuryModelRule-111405.pdf>.

National Energy Technology Laboratory. 2007. CO<sub>2</sub> Capture: Comparison of Cost and Performance of Gasification and Combustion-based Plants. PowerPoint Presentation by Joseph Ciferno, National Energy Technology Laboratory. March 14, 2007. Available at <http://www.gasification.org/Docs/Workshops/2007/Denver/02%20Ciferno.pdf>.

----- . 2008. Tracking New Coal-Fired Power Plants. PowerPoint presentation by Erik Shuster. February 18, 2008. Available at <http://www.netl.doe.gov/coal/refshelf/ncp.pdf>.

National Parks and Conservation Association. 2008. Comments on the Draft Prevention of Significant Deterioration Permit to Construct and Operate Virginia Electric and Power Company's Virginia City Hybrid Energy Center. March 12, 2008. Available from the Virginia Department of Environmental Quality.

National Park Service. 2008. Comments on the Virginia City Hybrid Energy Center Prevention of Significant Deterioration (PSD) Permit Application. March 12, 2008. Available from the Virginia Department of Environmental Quality.

Schlesinger, William H. 2008. Calculation of carbon sequestration in forests required to mitigate greenhouse warming potential associated with Dominion Energy's Virginia City Hybrid Energy Facility. April 10, 2008, personal communication to Vivian E. Thomson. Included as Attachment A.



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Southern Environmental Law Center. 2008. Comments on the Draft PSD Permit for the Virginia City Hybrid Energy Center. March 12, 2008. Available at [http://www.southernenvironment.org/cases/wise\\_county/index.htm](http://www.southernenvironment.org/cases/wise_county/index.htm).

US Environmental Protection Agency. 2007. Acid Rain and Related Programs: 2006 Progress Report. Available at <http://www.epa.gov/airmarkets/progress/docs/2006-ARP-Report.pdf>.

Virginia Department of Environmental Quality. 2008. Engineering Analysis for the Case-By-Base MACT Permit to Construct and Operate the Virginia City Hybrid Energy Center. Draft dated March 4, 2008.

----- . 2008a. Engineering Analysis for the Permit to Construct and Operate the Virginia City Hybrid Energy Center. January 7, 2008.

Virginia Department of Health. 2008. Fish Consumption Advisories: Tennessee and Big Sandy River Basin. Available at <http://www.vdh.virginia.gov/Epidemiology/PublicHealthToxicology/Advisories/TennesseeBigSandy.htm>).

Wise County Board of Supervisors. 2008. Resolution in support of the proposed Virginia City Hybrid Energy Center. January 11, 2008. Available at [http://www.wisecounty.org/BOS/res/res-support\\_hybrid\\_energy\\_ctr.pdf](http://www.wisecounty.org/BOS/res/res-support_hybrid_energy_ctr.pdf).

## Attachment A

10 April 2008

### *Calculation of carbon sequestration in forests required to mitigate greenhouse warming potential associated with Dominion Energy's Virginia City Hybrid Energy Facility*

William H. Schlesinger, President, The Cary Institute of Ecosystem Studies, Millbrook, NY

Trees are about 50% carbon by weight, which they obtain by removing carbon dioxide from the atmosphere in the process of photosynthesis. Pine plantations are particularly effective at such removal, which is why forest products companies plant so many of them. A typical plantation of southern pine accumulates about  $300 \text{ gC/m}^2$  (3 tons/ha) in new wood each year (see Table 4 of Galang 2007; slope of line in Figure 1 of Schiffman and Johnson 1989). A small additional amount of carbon is accumulated in fallen litter and debris on the surface of the soil, but changes in carbon in the deep soil are usually rather minor, especially if the plantation is located on previously forested land (Johnson 1992; Johnson et al. 2003; Schlesinger et al. 2007).

The expected emissions from the Dominion power plant are  $5.37 \times 10^6$  tons/yr of  $\text{CO}_2$ , equivalent to  $1.46 \times 10^{12} \text{ gC/yr}$ . If we assume  $300 \text{ gC/m}^2\text{yr}$  uptake by trees, to mitigate emissions would require planting trees on  $4900 \text{ km}^2$  of currently deforested land, nearly 5% of the State's area ( $110,862 \text{ km}^2$ ). If we use  $400 \text{ gC/m}^2\text{yr}$  to accommodate some accumulation of soil organic matter, then the area would be only  $3650 \text{ km}^2$ . For the length of time the trees are growing and the power plant is operating (both anticipated to be about 50 years), the uptake by trees would about balance the emissions from the power plant.

At 50 years, the trees would begin to slow in their rate of carbon uptake. To maintain the validity of the accumulated carbon credits, Dominion would have to ensure the permanence of the carbon stored in the forest or show the transfer of the carbon to long-lived wood products or land filled materials. Alternatively, the trees could be burned in the power plant, and the site replaced with another plantation. However, the trees in the second generation would not be eligible for carbon credits against the further burning of coal—that would require a new plantation on another tract of land.

***References to Attachment A***

Galang, J.S., C.E. Zipper, S.P. Prisley, J.M. Galbraith, and P.F. Donovan. 2007. Evaluating terrestrial carbon sequestration options for Virginia. *Environmental Management* 39: 139-150.

Johnson, D.W. 1992. Effects of forest management on soil carbon storage. *Water, Air and Soil Pollution* 64: 83-120.

Johnson, D.W., D.E. Todd, V.R. Tolbert. 2003. Changes in ecosystem carbon and nitrogen in a loblolly pine plantation over the first 18 years. *Soil Science Society of America Journal* 67: 1594-1601.

Schiffman, P.M. and W. C. Johnson. 1989. Phytomass and detrital carbon storage during forest regrowth in the southeastern United States Piedmont. *Canadian Journal of Forest Research* 19: 69-78.

Schlesinger, W.H., E.S. Bernhardt, E.H. DeLucia, D.S. Ellsworth, A.C. Finzi, G.R. Hendrey, K.S. Hofmockel, J. Lichter, R. Matamala, D. Moore, R. Oren, J.S. Pippen, and R.B. Thomas. 2006. The Duke Forest FACE Experiment: CO<sub>2</sub> Enrichment of a loblolly pine forest. Pp. 197-212. In J. Nosberger, S.P. Long, R.J. Norby, M. Stitt, G.R. Hendrey, and H. Blum (eds.). *Managed Ecosystems and CO<sub>2</sub>*. Springer-Verlag, Berlin.